"The students who knew the secret kept it carefully. . . .

"Sir Oliver Lodge wrote:

"'My dear Silvanus,

"'You know that book *Easy Lessons in the Calculus*, I have concluded that the book is by John Perry, but recently I have heard it attributed to yourself. I do not in the least think that that is true, but perhaps you would not mind sending me a postcard either of denial or acceptance, for evidently the anonymity is not carefully preserved.

"'Yours ever,

"'Oliver Lodge.'

"After the death of the author the book was published in his name, and is still being largely used, both in this country and in America." [Pages 138–140.]

ARTICLES IN CURRENT PERIODICALS.

American Machinist, New York, volume 53, August 26, 1920: "Teaching machine shop mathematics" by G. Heald, 421.

Annals of Mathematics, second series, volume 22, no. 1, September, 1920: "On multiform functions defined by differential equations of the first order" by P. Boutroux, 1–10; "Hermitian metrics" by J. L. Coolidge, 11–28; "On the expansion of certain analytic functions in series" by R. D. Carmichael, 29–34; "Notes on the cyclic quadrilateral" by F. V. Morley, 35–42; "Note on the preceding paper" by F. Morley, 43; "Qualitative properties of the ballistic trajectory" by T. H. Gronwall, 44–64.

Athenæum. London, October 22, 1920: "James Clerk Maxwell" by S., 557–558 [First paragraph: "The place that will be held by James Clerk Maxwell in the history of physics is not easy to determine. That it will be a very high place is obvious, that he will emerge as the greatest of the physicists of the nineteenth century is probable, but the student of Maxwell must feel that this kind of ranking is somehow irrelevant, or likely to become irrelevant, to his peculiar effect. The unique impression produced by Maxwell's achievement is not adequately described by being referred to his "originality." There are different ways of being original; it is not a sufficiently penetrating term. A number of Maxwell's scientific contemporaries were original men, but one is conscious that they had more in common with one another than Maxwell had with them. An exception from this statement is found in W. K. Clifford, who, as has often been remarked, had a genius curiously akin to Maxwell's. Both men were exceptionally *independent* thinkers, both men resisted the attraction of the high road; both men, if the term may be permitted, had a personal and unique angle of approach to the problems of their time. But this, though true, is not a sufficient description. It is important that in neither case do we feel their individual quality to be an eccentricity; their work has a power, and, still more, a comprehensive serenity, which is never the product of mere oddity—the oddity, for instance, of a Samuel Butler. If we try to get closer to this elusive and important characteristic we do not meet with much success; but we may suggest that the ideas of these men have the effect of springing from an unusually rich, subtle and comprehensive *context*. The fundamental ideas of the science of their time were subtly modified by reception into these minds; they were connected in a personal and unusual web of implications."]

Bulletin des Sciences Mathématiques, volume 55, July, 1920: Review by A. Buhl of C. I. Lewis's, *A Survey of Symbolic Logic* (Berkeley, 1918), 154–155.

Chimie et Industrie, Paris, volume 3, May, 1920: "De l'influence des spéculations mathématiques sur les progrès de la chimie" by H. LeChatelier, 555–565 [translated into English, *Scientific American Monthly*, volume 2, November, 1920, pp. 229–234].—Volume 4, August, 1920: "A propos de la formation des chimistes" by E. Grandmougin, 252–254.

Engineering, London, volume 109, June 11, 1920: "Mathematics for the engineer," 795–796.

L'Enseignement Mathématique, volume 21, no. 2, September, 1920: "Charles Ange Laisant, 1841–1920" (portrait frontispiece) by A. Buhl, 73–80; "Extension du problème des triangles héroniens" by C. A. Laisant, 80–84; "Sur l'élimination algébrique" by C. Riquier, 85–105; "Table de caractéristiques de base 30030 donnant, en un seul coup d'œil, les facteurs premiers des nombres premiers avec 30030 et inférieurs a 901800900" by E. Lebon, 105–116 ["Extrait de l'introduction"]; "Sur la théorie des vecteurs, essai de calcul symbolique" by T. Rousseau, 117–131; "Calcul des racines reélles d'une équation algébrique ou transcendante par

approximations successives" by M. T. Béritch, 131–135; Mélange et correspondance, Chronique, Notes et documents, Bibliographie, Bulletin bibliographique, 136–152.

Génie Civil, Paris, volume 76, June 26, 1920: "Histoire des machines à calculer" by M. d'Ocagne, 580–581.

Journal de Mathématiques Pures et Appliquées, 8e série, tome 2, 1919: "Sur les représentations propres pour quelques formes quadratiques de Liouville" by E. T. Bell, 349–271.

Journal of the American Institute of Electrical Engineers, volume 39, July, 1920: "Alignment chart for circular and hyperbolic functions of a complex argument in rectangular coordinates" by V. Bush, 658–659.

Journal of Applied Psychology, volume 4, nos. 2 and 3, June–September, 1920: "Tables to facilitate the computation of coefficients of correlation by the rank difference method," 115–125.

Machinery, New York, volume 26, January, 1920: "To draw a circle tangent to three given circles" by C. N. Pickworth, 459–460 ["An answer to this problem was given in the March, 1917, number of *Machinery* in which the center of a circumscribed circle was found by modern or projective geometry. This method is very complicated: it requires a large number of operations, but gives no means of calculating the diameter of the circumscribed circle. The following solution is based upon the following geometric theorem: If three circles are mutually tangential, a line drawn from the center of similitude of two of the circles tangent to the third circle, is also tangent to a circle which is tangent to the three circles." The following formula for the radius of the tangential circle, touching the given circles, all internally or all externally, is credited to C. V. Durell:

$$R = \frac{abc}{(ab + bc + ac) \sim 2\sqrt{abc(a + b + c)}},$$

where a, b, c are the radii of the given circles.]

The Mathematics Teacher, volume 13, no. 1, September, 1920: "The teaching of verbal problems" by E. R. Breslich, 1–12; "The teaching of mathematics in the Junior High School" by Margaret E. Davis, 13–24; "The metric system. Its relation to mathematics and industry" by W. Souder, 25–35; A statement of the plans and purposes of the National Council of Teachers of Mathematics, 39–43.

Mind, October, 1920: "The philosophical aspect of the theory of relativity" (symposium) by A. S. Eddington, W. D. Ross, C. D. Broad, and F. A. Lindemann, 415–445.

Monist, volume 30, no. 4, October, 1920: "On the theory of probabilities" by Dorothy Wrinch, 618–623.

Nature, volume 106, September 30, 1920: "Ballistic calculations" by D. R. Hartree, 152–154—October 7: "Principles of aeronautics" [review of E. B. Wilson's *Aeronautics: a Class Text* (New York, 1920), 173–174]; "International catalogue of scientific literature," 195–196 [an account of the conference at London, September 28–29, 1920, attended by delegates from 14 countries; "the conference was called to consider whether any modifications in the present Catalogue are advisable and how the difficulties created by the war can best be overcome. . . . [The delegates] came to the conclusion that, even though a change be made in the future in the method of indexing, it is imperative to continue the International Catalogue of Scientific Literature in its present form until the literature published up to the end of the year 1915, and possibly also that up to the end of the present year 1920, has been catalogued. . . . The question as to the future of the Catalogue after the completion of the twentieth issue was referred to a committee of the delegates for further consideration . . ."]; "The international congress of mathematicians," 196–197—October 14: "Lunar tables" by H. C. P. [review of E. W. Brown's *Tables of the Motion of the Moon* (New Haven, 1919)] 203–205—October 21: Review by W. E. H. B. of G. H. Hardy's *Some Famous Problems of the Theory of Numbers and in particular Waring's Problem* (Oxford, 1920), 239–240; "Ewing's 'Thermodynamics'" [three corrections by the author], 242.

Philosophical Magazine, sixth series, volume 40, October, 1920: "On a method of finding a parabolic equation of the rth degree for any graphically faired curve" by T. C. Tobin, 513–515.

Popular Astronomy, volume 28, no. 8, October, 1920: "The orthographic projection of a sphere" by W. H. Pickering, 446–448; "The first attempt to adopt the Gregorian calendar in England" by R. Lamont, 470–473; "Some recollections of John A. Brashear" by H. B. Rumrill, 474–475.

Proceedings of the London Mathematical Society, second series, volume 19, October, 1920: "A new theory of measurement—a study in the logic of mathematics" by N. Wiener, 181–205.

Proceedings of the National Academy of Sciences of the U. S. A., volume 6, no. 7, July, 1920: "Analytical note on certain rhythmic relations in organic systems" by A. J. Lotka, 410–415; "On the class number of the field $\Omega(e^{2i\pi/l^n})$ and the second case of Fermat's last theorem" by H. S. Vandiver, 416–421.

School and Society, volume 12, October 9, 1920: "Application of business principles in Junior High School mathematics" by T. Lindquist, 304–307—October 30: "Why study mathematics?" by A. Dresden, 390–395.

School Science and Mathematics, volume 20, no. 7, October, 1920: "A problem and its numerical solution" by W. W. Sleater, 612–618; "The use of charts for prose problems" by J. A. Nyberg, 619–623; "The teaching of logarithms and the slide rule in the ninth grade" by C. E. Stromquist, 624–628; "A study of examinations and tests" by Mabel W. Arleigh, 629–631.

Science, n.s., volume 52, October 1, 1920: "Electricity and gravitation" by H. Bateman, 314–315—October 22: "The summer meeting of the American Mathematical Society" by A. Dresden, 393–394.

Science Progress, volume 15, October, 1920: "The measurement of surface tension" by W. N. Rae and J. Reilly, 223–233; Reviews by Dorothy Wrinch of S. Ganguli's *The Theory of Plane Curves: Parts I and II* (Calcutta, 1919), of H. T. H. Piaggio's *Differential Equations* (London, 1920), and of W. P. Webber and L. C. Plant's *Introductory Mathematical Analysis* (New York, 1919), 310–311; Reviews by H. S. J. of G. C. Comstock's *The Sumner Line or Line of Position as an Aid to Navigation* and *Blank Reduction Forms for Line of Position Observations* (New York, 1919) and of A. S. Eddington's *Space, Time, and Gravitation* (Cambridge, 1920), 312–313; Review by O. A. Craggs of B. K. Sarkar's *Hindu Achievement in Exact Science* (London, 1918), 337.

Scientific American Monthly, volume 1, March, 1920: "Trigonometric computer" by F. E. Wright, 228—Volume 2, November, 1920: "The education of chemists. Influence of mathematical speculations on the progress of chemistry" by H. LeChatelier, 229–234 [see *Chimie et Industrie* above].

Scientific Monthly, volume 11, no. 4, October, 1920: "The mathematician, the farmer, and the weather" by T. A. Blair, 353–361.

Texas Mathematics Teachers' Bulletin, volume 6, no. 1, November 10, 1920: "The work of the National Committee on mathematical requirements" by H. J. Ettlinger, 5–6; "A series of papers on fundamental concepts of mathematics," 7; "Mathematics the common denominator of the exact sciences" by T. McN. Simpson, 8–13; "An elementary comparison between the Euclidean geometry of the plane and the geometry of the surface of a sphere" by H. J. Ettlinger, 14–17; "Codes and ciphers" by Renke Lubben, 18–24; "An account of some philosophical theories of geometry" by Elizabeth Hutchings, 25–28 [a review of Russell's *Foundations of Geometry*, chapter 2]; "The foundations of geometry" by H. H. Hammer, 29–34 [a review of Hilbert's *Foundations of Geometry*]; "Junior high school mathematics" 35–49 [a reprint of *Secondary School Circular* no. 6, Washington, D. C., July, 1920]; "A problem involving indeterminate equations" by H. J. Ettlinger, 50–53; "The straight edge" by "A. N. Onymous," 54.

Times, Literary Supplement, London, volume 19, September 9, 1920 (also September 10): "First use of the decimal point"[1] by J. D. White, 584 [The letter: "Sir,—In the 'Encyclopædia Britannica' (11th ed., XXV, 910d) is an article on Stevinus, the introducer of decimal fractions, in which, after stating that decimal fractions were first proposed by Simon Stevinus in 'La Disme,' a small pamphlet first published in Dutch in 1586 and not exceeding seven pages in the French translation, and observing that the original notation of the decimal places by indices was rather unwieldy, the writer says, 'The point separating the integers from the decimal fractions seems to be the invention of Bartholomæus Pitiscus, in whose trigonometrical tables (1612) it occurs, and it was accepted by John Napier in his logarithmic papers (1614 and 1619).

"This reference to Pitiscus corrects the view that the first appearance of the decimal point, not merely in any book printed in this country, but in any book printed at all, was in the first edition in English of Napier's 'Descriptio' of logarithms (1616), in which both Briggs and Wright had a part. That erroneous view is to be found in various modern works on the history of mathe-

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[1] Reference may be given to Professor L. C. Karpinski's article "The decimal point" in *Science*, June 29, 1917, vol. 45 (2), pp. 663–665.—Editor.

matics, and even in the article 'Arithmetic' in the 'Encyclopædia Britannica' (11th ed., II, 535c) it is stated that 'The present decimal notation, which is a development of that of Stevinus, was first used in 1617 by H. Briggs, the computer of logarithms.' But the priority of Pitiscus is beyond question. On points of detail, however, the following observations may be made.

"1. The Dutch (Flemish) edition of Stevinus's work, entitled 'De Thiende,' has thirty-six pages and bears date Leyden, 1585. The French translation entitled, 'La Disme,' 'premierement descripte en Flameng, et maintenant conuertie en François,' forms part of Stevinus's larger work 'L'Arithmetique' (in which it occupies twenty-nine pages, the first seven of them being taken up with introductory matter) which is dated from the same press at Leyden in the same year, 1585. The English translation entitled 'Disme: The Art of Tenths, or, Decimall Arithmetike,' by Robert Norton, bears date London, 1608.

"2. Before using the decimal point in the tables to the third edition of his 'Trigonometria' (Frankfort, 1612), Pitiscus had used it in a similar way in the similar tables to the second edition of that work, published at Augsburg in 1608, which therefore seems to be the date of its first appearance. He had not used it in the shorter tables to the first edition of that work, published at Augsburg in 1600.

"3. The decimal point was not used in the original Latin edition of Napier's 'Descriptio' (Edinburgh, 1614), and the first of his publications in which it is used was the edition of that work in English (London, 1616), already mentioned.

"That the decimal point should have made its first appearance in trigonometrical tables is not surprising when we remember that at the time when Pitiscus wrote there were already in use various tables of natural sines, etc., which were stated as integral numbers to radius 10,000,000, or some other power of 10. Rheticus, for instance, in his 'Canon Doctrinæ Triangulorum' (Leipsig, 1551) had set out a table of sines, etc., to radius 10,000,000, the sine, for example, of 22° 30′ being given as 3826834. Pitiscus, in the tables to his first edition of his 'Trigonometria' (Augsburg, 1600) stated them to radius 100,000, giving the sine of this angle as 38268. This reduction by two figures was a reduction in accuracy, and the effect was particularly noticeable in the case of angles in the neighbourhood of 89° and 90°, where the sines for several successive minutes are the same for the first five figures, and the differences do not become apparent till the sixth or seventh figure. In the more extensive and elaborate tables to his second edition (1608), Pitiscus retained his comparatively convenient radius of 100,000, placed a point—an ordinary full stop—after the last integer, and added the subsequent figures as decimals; thus, for example, he gives the sine of the angle already mentioned as 38268.34. In the case of the larger angles he availed himself for this purpose of the more extended integers that had been tabulated to radius 10,000,000,000 in the 'Opus Palatinum' of Rheticus and Otho (1596), and gives, for instance, the sine of 89° 10′ as 99989.42319.

"Napier, in the original Latin edition of the 'Descriptio' (1614), gives the natural as well as the logarithmic sines for each minute of the quadrant, stating both of them as integral numbers to radius 10,000,000 and not using the decimal point. In the English edition (1616), the radius was taken as 1,000,000, and both the natural and the logarithmic sines are given to one figure less than before for angles from 0° to 89°. Thus, for instance, the natural sine of 22° 30′, which had been given in the Latin work as 3826834, was given in the English work as 382683. In the cases, however, of angles from 89° to 90°, the difficulty already mentioned was overcome in the same way as Pitiscus had overcome it by placing a point—an ordinary full stop—after the sixth figure, and adding what had previously been the seventh figure as a decimal. Thus, for instance, the natural sine of 89° 10′, which appears in the Latin work as 9998942, appears in the English work as 999894.2.

"In modern practice, of course, both the natural and the logarithmic sines, etc., are given to radius 1, the last mentioned natural sine being stated as 0.9998942. This shifting of the decimal point (now printed as here), so as to give the quantity to radius 1, seems simple enough to us; but its development was retarded partly by the fact that the sines of the smaller angles were represented by fewer figures than those of the larger ones. Thus the natural sine of 0° 30′, as given by both Rheticus and Napier to radius 10,000,000, is 87265. To radius 1 it is, of course, 0.0087265. But the use of preliminary 0's, which is requisite for this development, belongs to a considerably later stage of progress.

"It is 'pretty to observe'—as Pepys would have said—that an English edition of Pitiscus's work by Raphe Handson appeared in 1614, and that if Handson had reprinted the later tables, his would have been the first book printed in this country to contain the decimal point. But —practical man!—he explains in his preface that their greater complexity 'was thought to be

more troublesome to the Marriners, and therefore the Tables last printed by Pitiscus were omitted as overtedious, his first being annexed herewith for the more ease in working. But if any man desire those Tables themselves, they may buy them apart in the Latin printed at Franckford, 1612.' In view of these observations it would seem that the tables of Pitiscus were not unknown in this country; and it appears unlikely that the mathematicians who used the decimal point in the English edition of the 'Descriptio' of 1616 were unacquainted with the tables of 1608 and 1612, in both of which it had been used."]

Tôhoku Mathematical Journal, volume 18, nos. 1 and 2, August, 1920: "Generalization of Bessel's and Gram's inequalities and the elliptic space of infinitely many dimensions" by K. Ogura, 1–22; "The irreducible cases of algebraic solutions" by C. E. White, 23–33; "Remarque sur un théorème relatif aux racines de l'équation $a_nx^n + a_{n-1}x^{n-1} + \ldots + a_1x + a_0 = 0$ où tous les coefficients a sont réels et positifs" by G. Eneström, 34–36; "Theorems on convergent integrals" by T. Kojima, 37–45; "A proof of a theorem of Haskell's" [in Japanese] by T. Kubota, 46–48; "On the interpolation by means of orthogonal sets" by K. Ogura, 49–60; "On the interpolation by Legendre polynomials" by K. Ogura, 61–74; "On certain inequalities" by T. Hayashi, 75–89; "Sur les courbes orbiformes. Leur utilisation en mécanique "by G. Tiercy, 90–115; "On the passing of simple continuous arcs through plane point sets" by J. R. Kline, 116–125; "Einige Sätze über charakteristische Eigenschaften gewisser Flächen" by T. Kubota, 126–127; "On Bertrand curves" by M. Tajima, 128–133; "On continuous set of points, II" by K. Yoneyama, 134–186; Shorter notices and reviews, Miscellaneous notes, 187–203.

Zeitschrift für mathematischen und naturwissenschaftlichen Unterricht, volume 51, nos. 7–8 (published July 22, 1920): "Fragen der Oberlehrerausbildung mit Beziehung auf angewandte Mathematik und Technik by R. Rothe, 177–190; "Die Genauigkeit des logarithmisch-trigonometrischen Rechnens" by A. Fischer, 191–195; "Die Einführung des Kraftbegriffes auf der Oberstufe" by K. Hahn, 195–198; "Bildliche Darstellungen gewisser Summenformeln" by K. Bochow, 198–203; [geometrical representations of $\sum_1^n n^2$, $\sum_1^n n^3$, and $\sum_1^n n^4$, together with their relations to each other and to $\sum_1^n n$;] "Zur Vielpassaufgabe" by H. Dostal, 204; "Aufgabenrepertorium," 204–207; [Discussion of the system of equations $ax + (a + n)y + (a + 2n) = 0$, $(a + 3n)x + (a + 4n)y + (a + 5n) = 0$] by P. Schulze, 216.

UNDERGRADUATE MATHEMATICS CLUBS.

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CLUB TOPICS.

18. Finite Geometries. By U. G. Mitchell, University of Kansas.

General analytic and synthetic definitions of finite (or modular) projective geometries were given by Veblen and Bussey, *Transactions of the American Mathematical Society,* Vol. 7 (1906), pp. 241–259. They used the symbol $PG(k, p^n)$; where k, p and n are integers and p a prime, to represent a finite projective space of k dimensions having $p^n + 1$ points on every line. As they pointed out (pp. 258–259) the finite geometries so defined included many new configurations[1] and many that were already well known. The $PG(k, p)$ had been defined

[1] The term "configuration" in its projective geometry sense seems to be due to Theodor Reye who used it first in 1876 in his *Geometrie der Lage,* Band I, 2 Aufl., S. 4, and who defined the term for the two-space and three-space in his article "Das Problem der Configurationen" in *Acta Mathematica,* Vol. 1, pp. 93–96. The general matrix definition now in use was given by E. H. Moore, "Tactical Memoranda," *American Journal of Mathematics,* Vol. 18 (1896), pp. 264–303.